

CLAIMS

What is claimed is:

1. An integrated circuit die comprising:

a multiplexer having a first terminal coupled to a first digital signal line

5 that when at a first state is at a voltage dependent upon a first power supply voltage, a second terminal coupled to a second digital signal line that when at a first state is at voltage dependent upon a second power supply voltage, and a third terminal, the multiplexer receiving a control signal, the multiplexer coupling its third
10 terminal to one of at least its first terminal or its second terminal based upon the control signal;

a level shifter having a first signal terminal coupled to the third terminal of the multiplexer, a second signal terminal coupled to a third circuit, and a voltage supply terminal; and

15 a second multiplexer having a first terminal coupled to receive a voltage dependent upon the first power supply voltage, a second terminal coupled to receive a voltage dependent upon the second power supply voltage, and a third terminal coupled to the voltage supply terminal of the level shifter, the second multiplexer receiving a
20 second control signal, wherein the second multiplexer provides at its third terminal a voltage of one of at least a voltage of its first terminal or a voltage of its second terminal based upon the second control signal.

2. The integrated circuit die of claim 1 wherein the third circuit includes a
25 pad of the integrated circuit die.

3. The integrated circuit die of claim 1 wherein the first control signal and the second control signal are dependent upon a common control signal.
4. The integrated circuit die of claim 3 wherein the first control signal and the second control signal are dependent upon a common control signal such that
5 when the multiplexer couples its third terminal to its first terminal, the second multiplexer provides at its third terminal the voltage of its first terminal and such that when the multiplexer couples its third terminal to its second terminal, the second multiplexer provides at its third terminal the voltage of its second terminal.
- 10 5. The integrated circuit die of claim 1 wherein the level shifter includes a second supply terminal coupled to receive a third voltage that is different from a voltage provided to the supply terminal of the level shifter.
6. The integrated circuit die of claim 5 wherein the third circuit is powered at the third voltage.
- 15 7. The integrated circuit die of claim 5 wherein the third voltage is higher than the voltage provided to the supply terminal of the level shifter.
8. The integrated circuit die of claim 1 further comprising:
a first circuit having a terminal coupled to the first digital signal line, the
first circuit being powered at the first power supply voltage; and
20 a second circuit having a terminal coupled to the second digital signal
line, the second circuit being powered at the second power supply
voltage.

9. The integrated circuit die of claim 8 wherein the first circuit includes a digital signal processor core and the second circuit includes an application processor core.
10. The integrated circuit die of claim 1 further comprising:
5 a control register for storing a control value, the control signal and the second control signal being dependent upon the control value.
11. The integrated circuit die of claim 10 further comprising:
a second level shifter having a signal input coupled to an output of the control register to receive a signal indicative of the control value,
10 wherein the second level shifter includes a signal output, wherein the control signal and the second control signal are dependent upon the output of the second level shifter.
12. The integrated circuit of die of claim 1 wherein the multiplexer and the second multiplexer each include a power supply terminal for receiving a third
15 power supply voltage.
13. The integrated circuit die of claim 12 wherein the third circuit receives the third power supply voltage, wherein the level shifter includes a second voltage supply terminal coupled to receive the third power supply voltage.
14. The integrated circuit of claim 1 wherein the first multiplexer and the
20 second multiplexer are characterized as being analog multiplexers.
15. The integrated circuit of claim 14 wherein the first multiplexer includes a pass gate.

16. The integrated circuit of claim 1 wherein:

the first signal terminal of the level shifter is an input signal terminal of the level shifter.

17. The integrated circuit of claim 1 further comprising:

5 a third multiplexer having a first terminal coupled to a third digital signal line that when at a first state is at a voltage dependent upon the first power supply voltage, a second terminal coupled to a fourth digital signal line that when at a first state is at a voltage dependent upon the second power supply voltage, and a third terminal, the third
10 multiplexer receiving a third control signal, the third multiplexer coupling the third terminal to one of at least its first terminal or its second terminal based upon the third control signal; and
a second level shifter having a first signal terminal coupled the third terminal of the second multiplexer and a voltage supply terminal
15 coupled to the third terminal of the second multiplexer.

18. The integrated circuit die of claim 17 wherein the first control signal, the second control signal, and the third control signal are dependent upon a common control signal.

19. The integrated circuit of claim 17 wherein:

20 the second level shifter includes a second signal terminal coupled to the third circuit;
the first signal terminal of the level shifter is an input signal terminal;
the second signal terminal of the level shifter is an output signal terminal;
the first signal terminal of the second level shifter is an output signal
25 terminal; and

the second signal terminal of the second level shifter is an input signal terminal.

20. The integrated circuit of claim 19 wherein the third circuit includes an input/ output pad of the integrated circuit die.

5 21. The integrated circuit of claim 17 wherein:
the first digital signal line is an output signal line of a first circuit;
the third signal line is an input signal line of the first circuit;
the second digital signal line is an output signal line of a second circuit;
and

10 the fourth signal line is an input signal line of the second circuit.

22. A wireless device including the integrated circuit die of claim 1.

23. The wireless device of claim 22 wherein the wireless device performs voice and/or data transmitting and/or receiving functions.

24. A method of multiplexing digital signal lines comprising:
15 selecting one of at least a first digital signal line and a second digital
signal line to couple to a signal terminal of a level shifter for
conveying a digital signal between the level shifter and the one of
the at least first digital signal line and the second digital signal line;
powering a first circuit coupled to the first digital signal line at a first
20 power supply voltage, wherein when the first digital signal line is at
a first state, the first digital signal line is at a voltage dependent
upon the first power supply voltage;

powering a second circuit coupled to the second digital signal line at a second power supply voltage, wherein when the second digital signal line is at a first state, the second digital signal line is at a voltage dependent upon the second power supply voltage; and

5 selecting one of at least a first voltage and a second voltage to supply to a supply voltage terminal of the level shifter, wherein the first voltage is dependent upon the first power supply voltage and the second voltage is dependent upon the second power supply voltage, wherein the first voltage is selected when the first digital signal line
10 is selected to be coupled to the signal terminal and the second voltage is selected when the second digital signal line is selected to be coupled to a signal terminal.

25. The method of claim 24 further comprising:

adjusting the voltage powering the first circuit to power the first circuit at
15 a third power supply voltage, wherein the adjusting further includes supplying a third voltage dependent upon the third power supply voltage to the supply voltage terminal of the level shifter when the first digital signal line is selected.

26. The method of claim 24 wherein the selecting one of at least a first digital
20 signal line and a second digital signal line and the selecting one of at least a first voltage and a second voltage further include writing to a control register a control value indicative of one of at least the first digital signal line and the second digital signal line.

27. The method of claim 24 further comprising:
providing by a first circuit a digital signal on the first digital signal line to
the signal terminal of the level shifter when the first digital signal
line is selected to be coupled to the signal terminal of the level
5 shifter.
28. The method of claim 27 further comprising:
level shifting by the level shifter the digital signal received from the first
digital signal line when the first digital signal line is selected to be
coupled to the signal terminal of the level shifter.
- 10 29. The method of claim 27 further comprising:
providing the digital signal from the level shifter to a pad of the integrated
circuit.
30. The method of claim 24 further comprising:
receiving by a first circuit a digital signal on a first digital signal line
15 when the first digital signal line is selected to be coupled to the
signal terminal of the level shifter.
31. An integrated circuit die comprising:
a first digital signal line coupled to a first circuit receiving a first power
supply voltage;
20 a second digital signal line coupled to a second circuit receiving a second
power supply voltage;
a level shifter having a signal terminal and a supply voltage terminal;

means for selecting one of at least the first digital signal line and the second digital signal line to be coupled to the signal terminal of the level shifter; and

5 means for selecting one of at least a first voltage dependent upon the first power supply voltage and a second voltage dependent upon the second power supply voltage to supply the supply voltage terminal, wherein the first voltage is selected when the first digital signal line is selected to be coupled to the signal terminal of the level shifter and the second voltage is selected when the second digital signal
10 line is selected to be coupled to the signal terminal of the level shifter.

32. The integrated circuit of claim 31 wherein the first digital signal line is an output signal line of the first circuit and the second digital signal line is an output signal line of the second circuit.

15 33. The integrated circuit die of claim 31 further comprising:

a third digital signal line coupled to the first circuit;

a fourth digital signal line coupled to the second circuit;

a second level shifter having a signal terminal and a supply voltage terminal; and

20 means for selecting one of at least the third digital signal line and the fourth digital signal line to be coupled to the signal terminal of the second level shifter, wherein the third digital signal line is selected when the first voltage is selected and the fourth digital signal line is selected when the second voltage is selected;

wherein the first voltage is supplied to the supply voltage terminal of the second level shifter when the first voltage is selected and the second voltage is supplied to the supply voltage terminal of the second level shifter when the second voltage is selected.